Fat grafting rescues radiation-induced joint contracture.

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Public Summary:

Scientific Abstract:
The aim of this study was to explore the therapeutic effects of fat grafting on radiation-induced hind limb contracture. Radiation therapy (RT) is used to palliate and/or cure a range of malignancies but causes inevitable and progressive fibrosis of surrounding soft tissue. Pathological fibrosis may lead to painful contractures which limit movement and negatively impact quality of life. Fat grafting is able to reduce and/or reverse radiation-induced soft tissue fibrosis. We explored whether fat grafting could improve extensibility in irradiated and contracted hind limbs of mice. Right hind limbs of female 60-day-old CD-1 nude mice were irradiated. Chronic skin fibrosis and limb contracture developed. After 4 weeks, irradiated hind limbs were then injected with (a) fat enriched with stromal vascular cells (SVCs), (b) fat only, (c) saline, or (d) nothing (n = 10/group). Limb extension was measured at baseline and every 2 weeks for 12 weeks. Hind limb skin then underwent histological analysis and biomechanical strength testing. Irradiation significantly reduced limb extension but was progressively rescued by fat grafting. Fat grafting also reduced skin stiffness and reversed the radiation-induced histological changes in the skin. The greatest benefits were found in mice injected with fat enriched with SVCs. Hind limb radiation induces contracture in our mouse model which can be improved with fat grafting. Enriching fat with SVCs enhances these beneficial effects. These results underscore an attractive approach to address challenging soft tissue fibrosis in patients following RT.